

State of California

Memorandum



Date: December 20, 2021

To: Andres Marquez, Southern California Gas Company (SCG); Ryan Cho, Southern California Edison (SCE); Jay Bhatka, SCE; Andres Fergadiotti, SCE; Danielle Dragon, Pacific Gas and Electric (PG&E); Henry Liu PG&E; Ed Reynoso, San Diego Gas and Electric (SDG&E); John Zwick (SDG&E); Nancy Goddard, PacifiCorp; Kenneth Liljestrom (SDG&E)

CC:

From: Peter Biermayer P.E., Utilities Engineer, EE Planning & Forecasting Section, Energy Division, CPUC

Subject: Energy Efficiency Disposition Approving Measure Package Smart Thermostat, Residential SWHC039-04

1. Discussion and Direction

The California Public Utilities Commission (CPUC) approves the statewide measure package Smart Thermostat, Residential: SWHC039-04. This measure package will replace the existing version SWHC039-03 and will become effective on January 1, 2022. This measure package SWHC039-04 is set to expire on December 31, 2022. The program administrators (PAs) are directed to revise the measure package for 2023 based on ongoing evaluation work in 2021 and early 2022. All additional analyses will be completed by Spring 2021 in time to facilitate a measure package update by June 1, 2022 to be effective January 1, 2023.

2. Measure Package Summary

Southern California Edison (SCE) submitted this revised measure package on November 23, 2021 to incorporate recent evaluation results from program year (PY)2019¹.

The following items were updated:

- Updated net-to-gross (NTG) based on PY2019 impact evaluation.
- Added exclusion of fan control technology for direct install (DI) measures.

¹ DNV GL. 2021. *Impact Evaluation of Smart Thermostats Residential Sector - Program Year 2019*. Prepared for the California Public Utilities Commission. June 16, 2021.

- Updated DI savings based on PY2019 impact evaluation adjusted by vendors and CPUC.
- Updated downstream savings to include temperature optimization (TO) for electric and gas
- Exclusion of fan control coincident savings.
- Added upstream program eligibility for rebate measures.
- Added Res building type for rebate measures.
- Updated measure and baseline costs based on newest online retailer cost and PY2019 evaluation weighting.

3. Critical Review Issues

Key review issues for this measure package included:

- 1) The application of TO savings for both electric and gas
- 2) Adjusting the allocation of the fan-delay feature for electric only savings
- 3) Updates to NTG

3.1 Thermostat Optimization Electric

The utilities claim the current evaluation results do not include thermostat optimization (TO) savings. At the time of the 2018 impact evaluation TO was only available on a limited basis and was not present at all in the electric savings estimates. Going forward, because optimization is now offered on a default basis to all thermostats, the utilities believe TO savings should be added to projected ex-ante savings estimates. For the interim period, until ex post impact evaluation results are produced that include TO savings, it is reasonable to increase SCT savings reflective of demonstrated opt-in rates and TO savings percentages.

TO was originally offered as an additional service that utilities could purchase to increase the savings from existing thermostats. One advantage of this approach is that vendors were able to set up randomized encouragement design (RED) experimental designs to assess the marginal savings from the TO. The RED provides robust estimates of AC runtime reductions from the TO that was applied during the experiment. The runtime reduction is translated to kWh reductions using an assumed AC connected load. This is a potential source of error in the estimate, but this approach is standard practice. The analysis was performed by NEST, vetted by Cadmus, and included as supporting materials in the measure package.

An ongoing challenge to the evaluation of SCTs is that the underlying savings algorithms are completely opaque to evaluators. Because evaluators are unable to know what is included in an SCT's base package and what is additional optimization, it is difficult to assess the relative savings of each step with complete certainty. The lack of transparency opens opportunities for mis-attributed savings. For example, TO evaluation results could have been enhanced by relaxing standard, non-TO algorithms in advance of the TO offering that was assessed for the study discussed above. This was challenged when TO was being claimed as a separate add-on savings source above "standard" SCT savings. Now that TO savings will be offered as part of the default savings offering, this potential source of concern will not be an issue. However, a simple additive addition of separately estimated TO savings has the effect of locking in these potentially concerning estimates into the ex-ante values.

In addition to the general concerns, the review team also notes that the proposed TO savings are based on TO estimates from the general population. The savings estimates are unlikely to reflect realistic TO savings estimates for DI customers. In prior discussions, the vendors have indicated the ability to identify DI thermostats from bulk orders. The review team suggests that the prior evaluations, performed by Nest, could offer valid TO estimates for DI customers if re-estimated with the inclusion of a DI flag. Recognizing that this depends on the presence of identifiable DI participants in the original RED experiment and the ability to retrospectively identify them, the review team understands that this re-estimation may not be feasible.

Finally, the review team also notes that all TO savings estimates are based on Nest data but are proposed as appropriate for all brands of thermostats. There has been extensive evidence in the SCT evaluation literature that different SCTs provide different levels of savings. It seems realistic that that same would be the case for TO savings.

In the interest of providing an ex-ante savings estimate that reflects the full savings potential of the SCT measure, the review team will support the addition of TO savings as proposed in the measure package. This is done with the full expectation that the 2022 SCT evaluations will produce evaluation results that include default TO and those savings will be used to update the SCT measure package for PY2023.

3.2 Thermostat Optimization Gas

Similar to electric TO, gas TO was not available to all customers that were included in the 2018 and 2019 impact evaluations. As a result, two issues had to be addressed. First, in the 2019 evaluation, gas savings for DI were set to zero despite some CZs having negative savings. This created potential issues with adding TO savings to a starting point of zero savings. Second, there were, in fact, participants in the impact analysis who did receive TO during the post-installation period. As a result, the existing estimates of zero savings included a portion of customers that received TO.

The review team supports the solution proposed by SCG which involves adding adjusted TO savings to the initial estimate of zero savings for DI. Gas savings were not statistically significantly different from zero, so a starting point of zero for the TO is reasonable under the circumstances. For rebate programs, the TO savings are added to existing non-zero savings estimates. In addition, for DI, SCG adjusted the savings downward based on the CZ level percentages of customers who took part in TO during the post-installation period. This reasonably accounts for the presence of customers on TO during the evaluation period. In general, the gas TO savings are applied in a manner that is consistent with electric TO savings while addressing the unique issues present in the gas use case.

3.3 Allocation of fan-delay

The review team supports addressing potential overlap of SCT and fan controls for the ex-ante values assuming the programs will no longer install the two measures at the same site. Rather than simply allocate the fan-delay savings to the SCT, the review team had the impact evaluation team proportionally reallocate total savings to all measures assuming that fan-control measure savings were zero. This methodology addresses the potential overlap of these two measures and is consistent with the way the 2019 DI evaluation was performed.

Fan-delay adjustment was not required for gas savings estimates.

3.4 Update of NTG values

The measure package increased the NTG rate for both rebate and direct install measures to reflect updated 2019 values. In both cases, the 2019 impact evaluation NTG estimate was 0.05 higher than the 2018 value. The review team supports an increase of the rebate NTG to 0.60 from 0.55 and the direct install NTG to 0.95 from 0.90. These represent the 2019 values rounded up to the nearest 0.05 multiple.

4. Direction

The PAs are directed to revise the measure package for 2023 based on ongoing evaluation work in 2021 and early 2022. All additional analyses will be completed by Spring 2021 in time to facilitate a measure package update by June 2022 to be effective PY2023.